ADELSY srl
advanced electronic system
40127 BOLOGNA - Via del Fonditore, 5
(LOCALITA' ROVERI)
TEL. (051) 532119 (4 linee) - TLX 510226

02/306342/43/45
MI
CIMEE Elettronica Srl D,C,S,E,V
Goma Elettronica snc D
TO 011/758914 - 7493147
Sincas srl R, STEB snc -
02/564785
564962 -

RAYTHEON

Precision High Speed Latching Comparator

4805

Features

- 22nS Propagation Delay
- Low Offset Voltage — 100μV
- Low Offset Current — 15nA
- TTL Compatible Latch
- TTL Output

Description

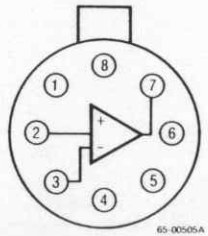
The RC/RM4805 is the ideal comparator for high speed, high precision applications. The input errors are factory trimmed to less than 1/10 LSB of a 12 bit, 10 volt system. The latch function allows the System Designer additional flexibility. When the latch input is a TTL low, the comparator functions normally. When the input is raised to a TTL high, the comparator output is latched in its current state. The latch functions over the full military temperature range.

The 4805 is ideal for ultra precise, very fast system designs. Typical applications include successive approximation A/D convertors of 12 or more bits, zero crossing detectors, high speed sampling, or window detectors.

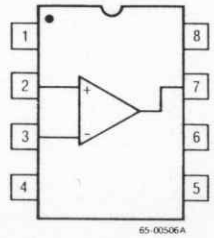
The 4805 high speed comparator is functionally equivalent to the more popular comparators, HA-4950, AM686, SE527, CMP-05 and μA760. Propagation delay is 35nS with a 1/2 LSB overdrive in a 12 bit, 10 volt system.

Connection Information

TO-99 Metal Can (Top View)

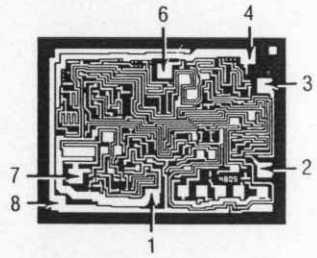


8-Lead Dual-in-Line Ceramic Package (Top View)



Pin	Function
1	Ground
2	Non-Inverting Input
3	Inverting Input
4	V–
5	NC
6	Latch Enable
7	V_{OUT}
8	V+

Mask Pattern

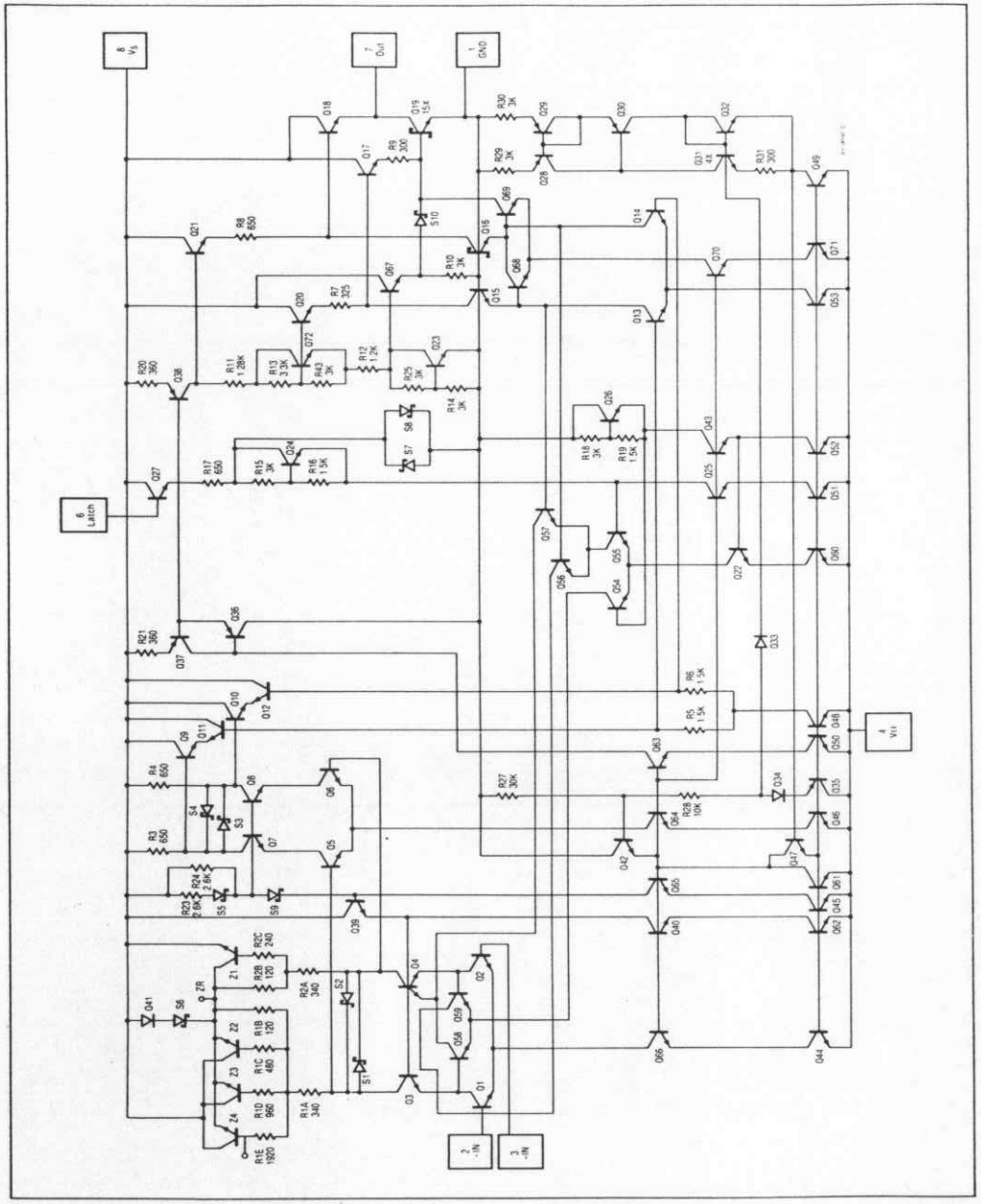


Die Size: 51 x 67 mils
Min. Pad Dimensions: 4 x 4 mils

Thermal Characteristics

	8-Lead Ceramic DIP	8-Lead TO-99 Metal Can
Max. Junction Temp.	175°C	175°C
Max. P_D T_A < 50°C	833mW	658mW
Therm. Res. θ_{JC}	45°C/W	50°C/W
Therm. Res. θ_{JA}	150°C/W	190°C/W
For T_A > 50°C Derate at	8.33mW per °C	5.26mW per °C

Schematic Diagram



Precision High Speed Latching Comparator 4805

Absolute Maximum Ratings

Supply Voltage ..... +5.5V/-16.5V
Internal Power
Dissipation (Note 1) 500mW
Differential Input Voltage ..... ±3V
Input Voltage ..... ±4V
Storage Temperature
Range ..... -65°C to +150°C
Operating Temperature Range
RM4805 ..... -55°C to +125°C
RC4805 ..... 0°C to +70°C
Lead Soldering
Temperature (10 Sec) ..... 300°C

Note: 1. See table of thermal characteristics for maximum ambient temperature derating factor.

Ordering Information

Part Number	Package	Operating Temperature Range
RC4805DE	Ceramic	0°C to +70°C
RC4805EDE	Ceramic	0°C to +70°C
RC4805T	TO-99	0°C to +70°C
RC4805ET	TO-99	0°C to +70°C
RM4805DE	Ceramic	-55°C to +125°C
RM4805ADE	Ceramic	-55°C to +125°C
RM4805T	TO-99	-55°C to +125°C
RM4805AT	TO-99	-55°C to +125°C

Electrical Characteristics ($V_S = \pm5V$, RM = $-55°C \le T_A \le +125°C$; RC = $0°C \le T_A \le 70°C$, Latch Enable = 0 unless otherwise noted)

Parameter	Conditions	RM4805A/RC4805E			RM4805/RC4805			Units
		Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	$R_S \le 50\Omega$		0.25	0.80		0.50	1.5	mV
Input Offset Voltage Drift			1.5	7.5		2.5	15	$\mu V/°C$
Input Offset Current				200			400	nA
Input Bias Current				2.5			3.8	μA
Voltage Gain			15,000			15,000		V/V
Output Voltage	$V_{IN} > 10mV$, $I_O = 200\mu A$	2.2	2.5		2.2			V
	$V_{IN} < -10mV$, $I_{SINK} = 6.4mA$		0.3	0.45		0.3	0.45	
Input Voltage Range		±2			±2			V
Common Mode Rejection Ratio	$V_{CM} = \pm2.0V$, $R_S \le 50\Omega$	80			77			dB
Power Supply Rejection Ratio	$R_S \le 50\Omega$, $V_S+ = 5V$, $-5.25V \le V_S- \le -4.75V$ and $V_S- = -5V$, $= 4.75V \le V_S+ \le 5.25V$	72			70			dB
Positive Supply Current	$V \le 0.4V$		13	18		15	20	mA
Negative Supply Current	$V_O \le 0.4V$		15	20		15	20	mA
Power Dissipation	$V_O \le 0.4V$		140	190		150	200	mW
Propagation Delay	100mV Step, $V_{OD} = 5mV$		30	50		35	55	nS
	100mV Step, $V_{OD} = 1.2mV$		50			50		

Electrical Characteristics

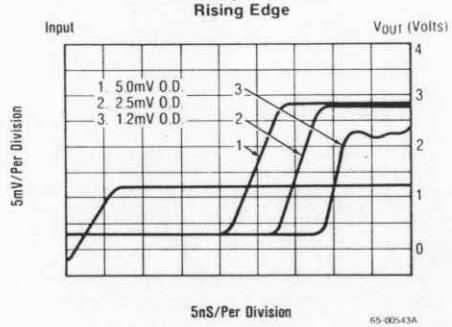
(V_S = ±5V, T_A = +25°C, Latch Enable = 0 unless otherwise noted)

Parameter	Conditions	RM4805A/RC4805E			RM4805/RC4805			Units
		Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	$R_S \leq 50\Omega$		100	250		250	600	μV
Input Offset Current			10	80		25	150	nA
Input Bias Current			0.7	1.2		0.9	1.8	μA
Voltage Gain			20,000			20,000		V/V
Output Voltage	V_{IN} > 10mV, I_O = 200μA	2.4	2.7		2.4	2.7		V
	V_{IN} < −10mV, I_{SINK} = 8.0mA		0.3	0.4		0.3	0.4	
Input Voltage Range		±2.2	±2.7		±2.0	±2.7		V
Common Mode Rejection Ratio	$R_S \leq 50\Omega$, V_{CM} = Min Input Voltage Range	84			80			dB
Power Supply Rejection Ratio	$R_S \leq 50\Omega$ V_{S+} = 5V, −5.25V ≤ V_{S-} ≤ −4.75 V and V_{S-} = −5V, 4.75V ≤ V_{S+} ≤ 5.25V	80			74			dB
	$R_S \leq 50\Omega$ V_{S+} = 5V, −5V ≤ V_{S-} ≤ −15V	80			76			
Positive Supply Current	$V_O \leq 0.4V$		11	16		13	18	mA
Negative Supply Current	$V_O \leq 0.4V$		12	16		13	18	mA
Power Dissipation	$V_O \leq 0.4V$		115	160		130	180	mW
Propagation Delay	100mV Step, V_{OD} = 5mV		22	35		22	35	nS
	100mV Step, V_{OD} = 1.2mV		35			35		
Latch Enable Time	V_{OD} = 5mV		16			16		nS
Disable Time	V_{OD} = 5mV		22			22		
Latch High Voltage		2.0			2.0			V
Low Voltage				0.8			0.8	
Latch High Current	V_{LH} = 3.0V			40			75	μA
Low Current	V_{LL} = 0.8V			10			20	

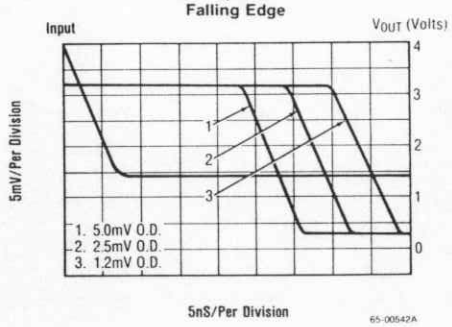
The information contained in this data sheet has been carefully compiled; However, it shall not by implication or otherwise become part of the terms and conditions of any subsequent sale. Raytheon's liability shall be determined solely by its standard terms and conditions of sale. No representation as to application or use or that the circuits are either licensed or free from patent infringement is intended or implied. Raytheon reserves the right to change the circuitry and other data at any time without notice and assumes no liability for inadvertent errors.

Typical Performance Characteristics

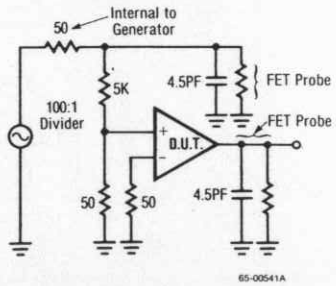
4805 Response Time Rising Edge



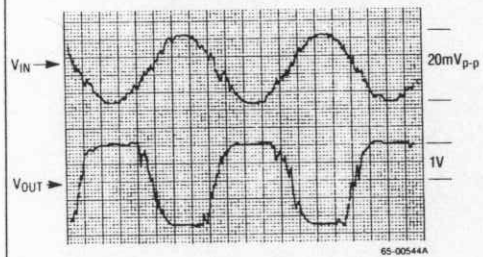
4805 Response Time Falling Edge



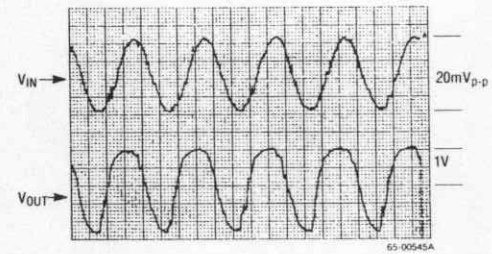
Response Photograph Test Setup



Response to 25MHz Sine Wave

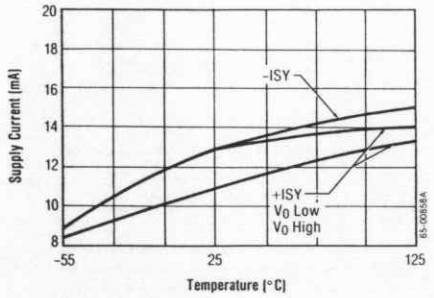


Response to 50MHz Sine Wave

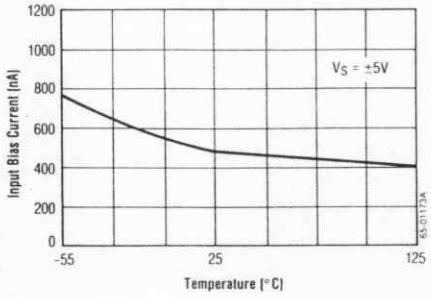


Typical Performance Characteristics (Continued)

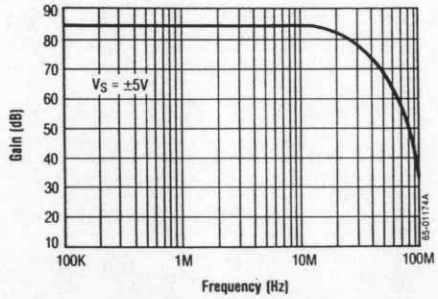
Supply Current vs Temperature



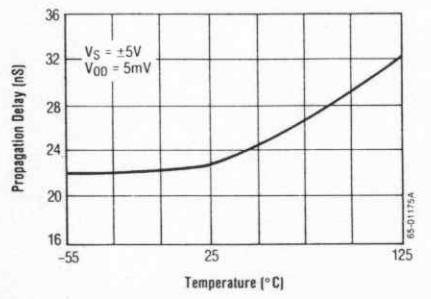
Input Bias Current vs Temperature



Gain vs Frequency



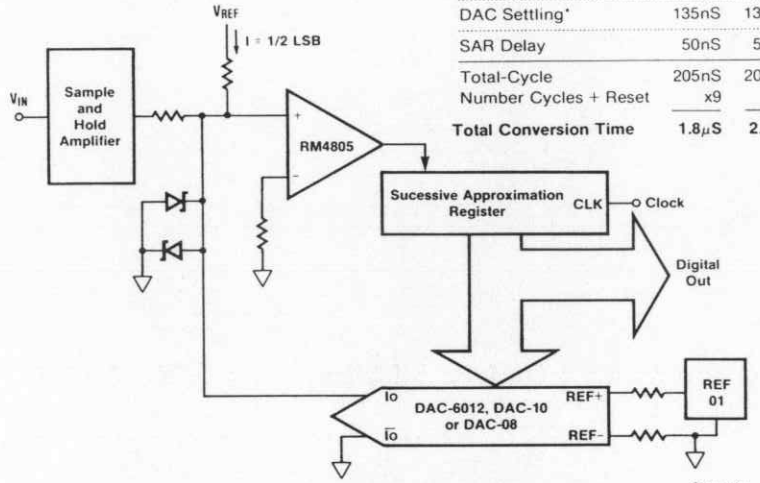
Propagation Delay vs Temperature



Precision High Speed Latching Comparator 4805

Typical Applications

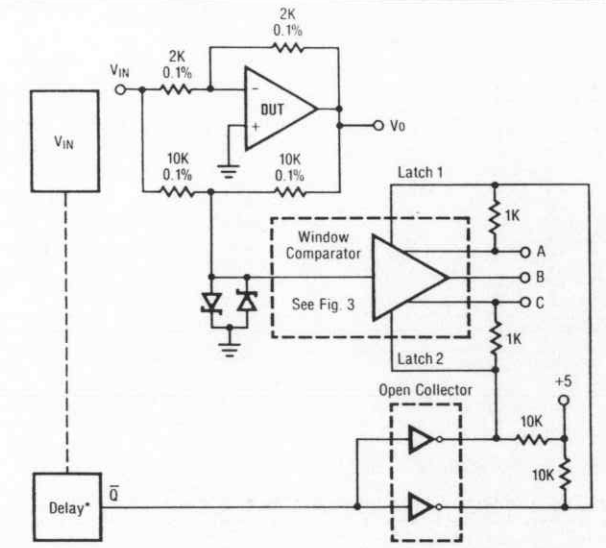
	Conversion Time 8-Bit	10-Bit	12-Bit
RM4805 Response	20nS	22nS	50nS
DAC Settling*	135nS	135nS	500nS
SAR Delay	50nS	50nS	50nS
Total-Cycle	205nS	207nS	600nS
Number Cycles + Reset	x9	x11	x13
Total Conversion Time	**1.8μS**	**2.3μS**	**7.8μS**



*Response will be affected by DAC's output capacitance and equivalent resistance.

Figure 1. Successive Approximation 8, 10, or 12-Bit Resolution

Typical Applications (Continued)

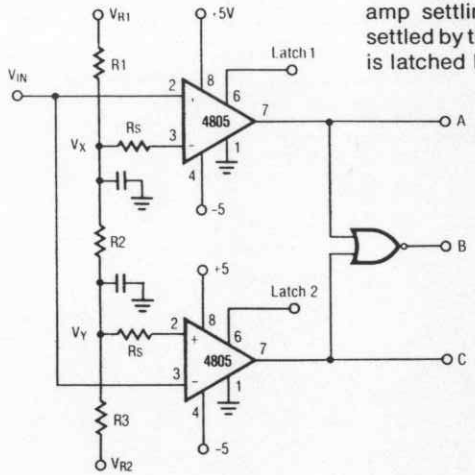


*Delay should equal the settling time specification minus 30nS minus appropriate guard band

65-01177A

Figure 2. Op Amp Settling Time Tester

The settling time tester uses the precision latching window comparator to automate op amp settling time testing. If the DUT is not settled by the end of the time delay, the A output is latched low.



V_{IN} (V_X - V_Y)*	A	B	C
V_{IN} - V_X	1	0	0
V_X - V_{IN} - V_Y	0	1	0
V_Y - V_{IN}	0	0	1

*Both latches low

65-01176A

Figure 3. Precision Latching Window Comparator (Detail)

RAYTHEON

Fast Latching ECL to TTL Line Translator, Up to 50MHz

The high speed differential input and the latched TTL output makes the RC4805 ideally suited for use as an ECL to TTL translator. Existing logic supplies of -5.2 volts and +5.0 volts are compatible with the RC4805 power supply requirements. With a TTL compatible latch input the RC4805 can be latched from the TTL subsystem or from the ECL subsystem, by using another RC4805 on the latch signal.

In ECL systems the termination resistors and pull-down resistors can be combined in a network as shown in Figure 4, a typical ECL to TTL translator. The configuration shown in Figure 6 has a common mode range of ±2.0 volts. But either input can swing as low as -5.0 volts below the input, providing one input stays in the ±2.0 volts common mode range. By using a -15 volt supply on the RC4805 the common mode range is extended to -8.0 volts, +2.0 volts as shown in Figure 5. The only caution is that the differential mode voltage must not exceed ±5.0 volts.

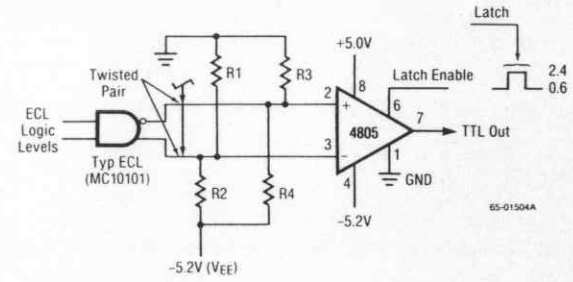
Not all ECL families have the same logic levels, the same logic level V_S supply voltage, or the same temperature characteristics. By using the same logic type as a reference a single-end ECL to TTL translator can be made to track changes in logic levels. A typical circuit is shown in Figure 6.

In system design one subsystem may in one configuration be driven with ECL line drivers, but in another configuration the same subsystem may be driven from a TTL gate.

High gain, low input bias current and ±2.0 volt common mode range on the RC4805 allow the easy design of an adaptive ECL-TTL to TTL translator. The ECL interface is the same as shown in Figure 4. By adding pull-up resistors and a bypassed level shifting resistor to the TTL outputs (See Figure 7), the same subsystem line receiver can interface with ECL or TTL with no hardware change in the receiver.

In summary, the RC4805 is a very flexible system element that allows the system designer to interface ECL to TTL in a number of easy to use configurations. The RC4805 can also be used in an adaptive ECL-TTL to TTL interface.

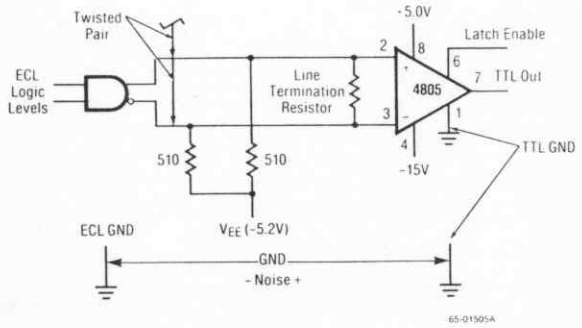
Typical Examples



65-01504A

Figure 4. Typical ECL to TTL Translator

Typical Examples (Continued)



Notes:

1. Common mode range of 4805 is -8.0V to +2.0V.
2. The 4805 can stand -3.0V, +5.0V of GND noise from the ECL GND to the TTL GND.

Figure 5. ECL to TTL Translator with Extended Common Mode Range

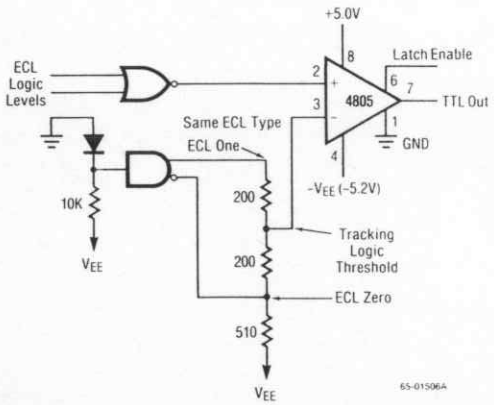
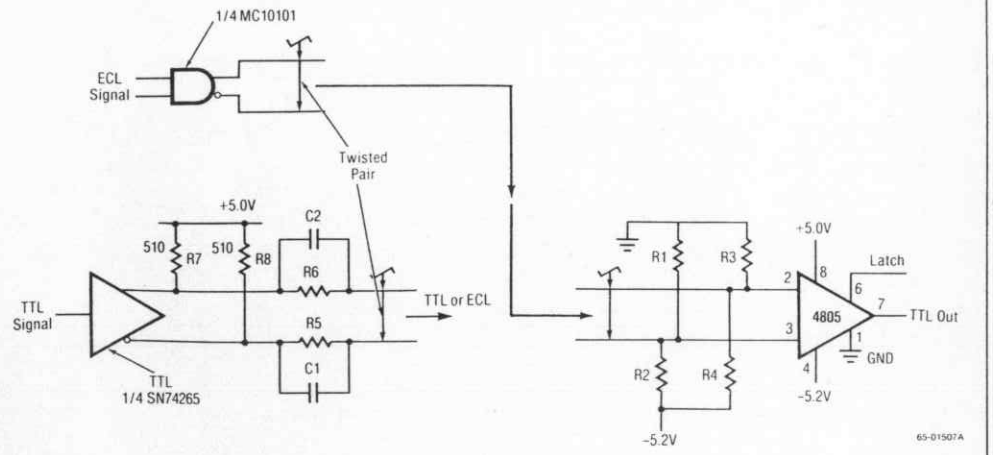


Figure 6. Single-Ended ECL to TTL Translator with Tracking ECL Reference

Typical Examples (Continued)



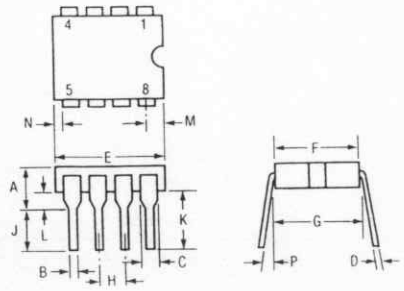
For 220Ω Line
V_{EE} = -5.2V
V_{THEV} = -2.0V
R1 = R3 = 179Ω 180Ω
R2 = R4 = 286Ω 270Ω
R5 = R6 = 1K
C1 = C2 = 50PF

Figure 7. Adaptive ECL-TTL to TTL Translator

Precision High Speed Latching Comparator

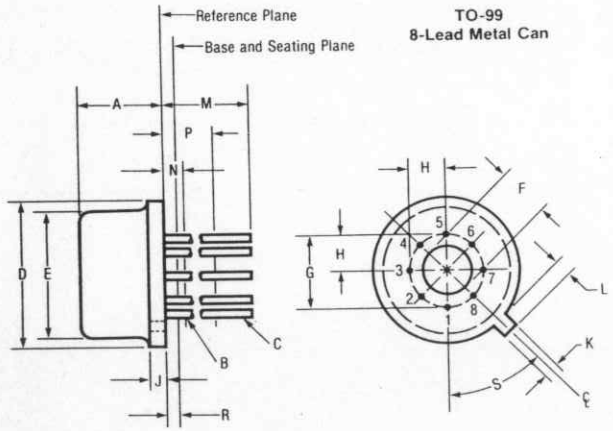
Packaging Information

8-Lead
Ceramic Dual-in-Line



Dimension	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A		.200		5.08
B	.014	.023	0.36	0.58
C	.030	.070	0.76	1.78
D	.008	.015	0.20	0.38
E		.390		9.91
F	.220	.310	5.59	7.87
G	.290	.320	7.37	8.13
H	.100 BSC		2.54 BSC	
J	.125	.200	3.18	5.08
K	.150		3.81	
L	.015	.060	0.38	1.52
M		.045		1.14
N	.005		0.13	
P	0°	15°	0°	15°

TO-99
8-Lead Metal Can



Dimension	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	.165	.185	4.19	4.70
B	.016	.019	.41	.48
C	.016	.021	.41	.53
D	.335	.370	8.51	9.40
E	.305	.335	7.75	8.51
F	.120	.160	3.05	4.06
G	.200 BSC		5.08 BSC	
H	.100 BSC		2.54 BSC	
J		.040		1.02
K	.027	.034	.69	.86
L	.027	.045	.69	1.14
M	.500	.750	12.70	19.05
N		.050		1.27
P	.250		6.35	
R	.010	.045	.25	1.14
S	45° BSC		45° BSC	

Germany
RAYTHEON HALBLEITER GmbH
Thalkirchner Str. 74
D-8000 München 2
Tel. 089/539693
Twx. 528242

Jochen Klepper Str. 76
D-2082 Uetersen
Tel. 04122-44950
Twx. 528242

France
RAYTHEON SEMICONDUCTOR
La Boursidière, RN 186
F-92357 Plessis Robinson Cedex
Tel. 01-6310676
Twx. 200389

United Kingdom
RAYTHEON SEMICONDUCTOR
Ogilvie Road
High Wycombe,
Bucks HP123DS.
Tel. 0494-450327
Twx. 838842

RAYTHEON